TUNGSTEN POTENTIAL IN CHAFFEE, FREMONT, GUNNISON, LAKE, LARIMER, PARK, AND SUMMIT COUNTIES, COLO.

BY CARL BELSER

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by

Carl Belser[1/]

CONTENTS

	Page
Introduction and summary	1
Physical features, facilities, and labor	1
Description of tungsten prospects	3
Chaffee County	3
Calumet mine	5
Sage claim	5
Cleora No. 2	5
Grand View mine	5
Mute lode	6
Hub tunnels	6
Stockton mine	6
Uncle Andy	7
North Star claim	7
Saddle claim	7
Poncha Pass claim	7
Lucky 2 claim	7
Fremont County	7
Nipple Mountain prospect	8
Bond Ranch mine	8
Venture No. 1 claim	8
Charlene No. 1 claim	8
Four Claim group	10
Oliver prospect	10
Gunnison County	10
Hubnerite mine	11
Ida Mae mine	11
Occident prospect	13
Molybdenite Extension No. 1	13
Complex mine	13
Kezer No. 2 prospect	13
Lilly Belle prospect	13

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CONTENTS (Con.)

	Page
Lake County	14
Larimer County	16
Green Rock mine	16
Spaulding mine	16
Lookout mine	16
Challenger mine	18
Ball Scheelite mine	18
Carter tunnel	18
Mason Ranch mine	18
Park County	19
Wheeler mine	21
Andes mine	21
Sweet Home mine	21
Bowers Ranch	21
Nix group	21
Pedro No. 1 and No. 2	22
Hallie claim	22
Saint Joe group	22
Scheelite Nos. 1 and 2	22
Badger group	22
Dorothy group	23
Victory group	23
Round Mountain group	23
Little Abner group	23
Wilfley group	23
Jefferyes group	24
Jasper Queen	24
Abel Mineral Land	24
Holmes Ranch	24
Gilley Ranch	25
B and G claim	25
School Section prospect	25
Copper King mine	25
West Ranch	25
Skinney claim	25
Nash, Johnson, and Townsend Ranches	26
Summit County	26
H. and M. Williams	26
Navy mine	26
Thomas Williams claims	28
Ore reserves	28
Metallurgy	28
Bibliography	31

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ILLUSTRATIONS

Fig.		Page
1.	Areas containing tungsten occurrences in Chaffee, Fremont, Gunnison, Lake, Larimer, Park, and Summit Counties, Colo.	2
2.	Location of known tungsten prospects, Chaffee County, Colo.	4
3.	Location of known tungsten prospects, Fremont County, Colo.	9
4.	Location of known tungsten prospects, Gunnison County, Colo.	12
5.	Location of Climax mine, Lake County, Colo.	15
6.	Location of known tungsten prospects, Larimer County, Colo.	17
7.	Location of known tungsten prospects, Park County, Colo.	20
8.	Location of known tungsten prospects, Summit County, Colo.	27
9.	Flowsheet of Bon Ton tungsten mill, Gunnison County, Colo.	29
10.	Flowsheet of tungsten, tin, and monazite concentrating units in the Climax Molybdenum Co. mill	30

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INTRODUCTION AND SUMMARY

This paper, covering Chaffee, Fremont, Gunnison, Lake, Larimer, Park, and Summit Counties, Colo., is the second of a series reporting on the tungsten potential of the Colorado region. The assembled information was obtained by examination of some properties, personal contacts with owners, and access to unpublished reports by other engineers. The tungsten-bearing areas of the 7 counties cover approximately 400 square miles and are in 10 distinct areas, which vary in size (fig. 1) from 1 square mile up to 290 square miles.

The tungsten mineral wolframite was discovered by a man named Hackay near Dale on the Florence & Cripple Creek Railroad in the early 1900's, and wolframite and hübnerite were noted at Climax and the adjacent areas in Lake and Summit Counties at an early date, but no records of shipment from any of the areas are available before World War II. It is not known when scheelite was first discovered, but it was recognized in the Stockton mine during World War I. In the counties listed 64 properties are known to contain tungsten; of these, 18 have had some commercial output, although only 3 of them produced in 1953. The total production through 1953 is estimated at 115,000 short-ton units of tungsten trioxide. In 1953 by far the major portion came from the Climax mine.

Field work supporting these studies was done in 1951-54. Federal Geological Survey and Federal Bureau of Mines reports prepared from investigations made during World War II and those since 1950 for assistance under the Defense Production Act of 1950 were reviewed, and pertinent parts are included in this paper.

Reserves are estimated as 45,919 tons of inferred ore containing 0.81 percent of tungsten trioxide or 37,192 units, not including the reserves of the Climax Molybdenum Co.

PHYSICAL FEATURES, FACILITIES, AND LABOR

The scheelite areas in Chaffee, Fremont, Gunnison, Larimer, and Park Counties are in gently sloping uplands comprising rounded mountain tops and flat ridges separated by narrow valleys and deep canyons. Altitudes at the various mines range from 7,000 to 9,500 feet. Yearly precipitation averages 12 inches near Salida but is approximately 20 inches at highest altitudes. Winters are somewhat severe; but most roads could be kept open, except during the worst storms.

The wolframite-hübnerite areas of Gunnison, Lake, Park, and Summit Counties are in the higher mountains, and altitudes are 10,850 to 12,300 feet. The average yearly precipitation is about 30 inches. Winters are severe, and only large operations would justify road maintenance during periods of heavy snowfall.

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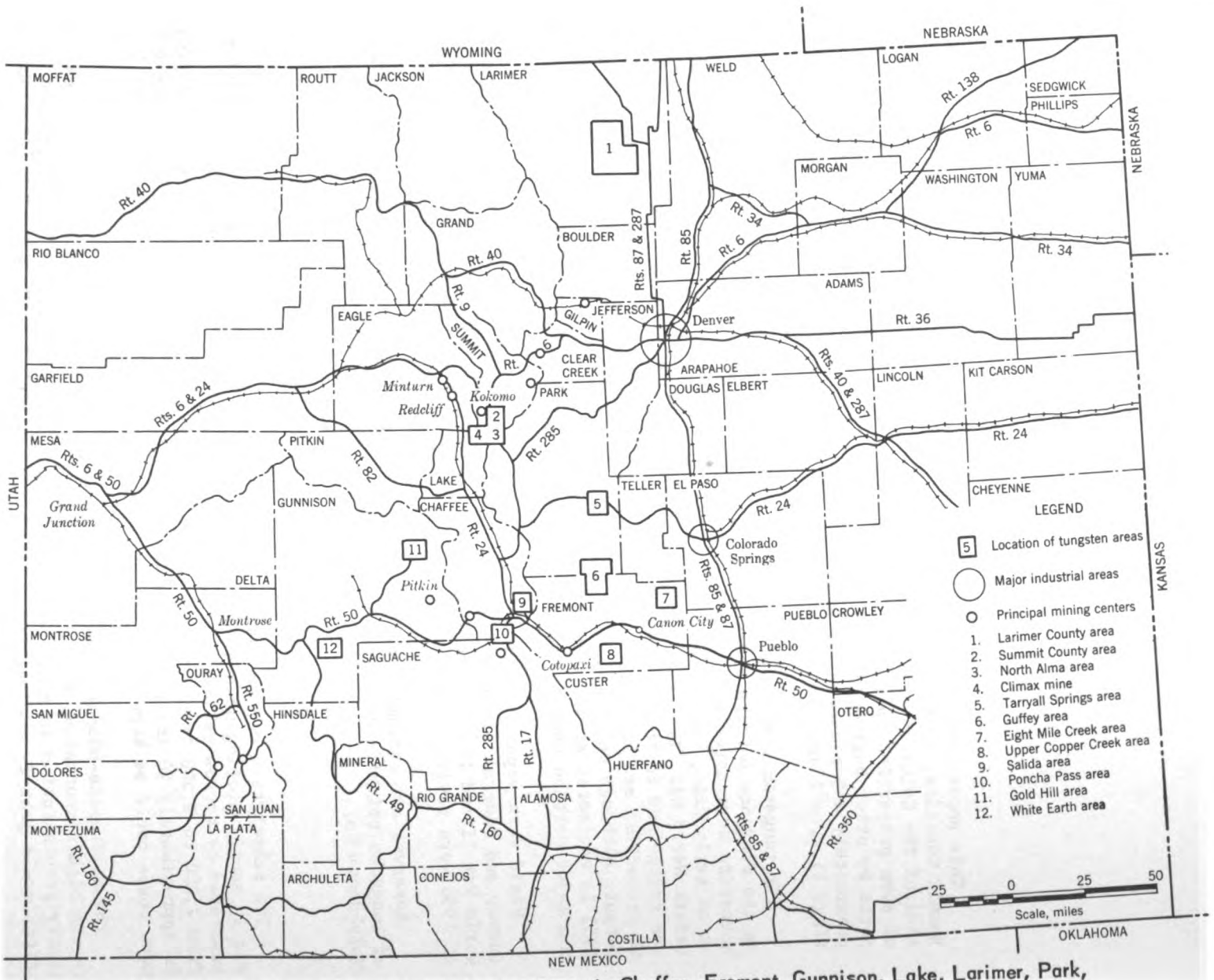

Figure 1. - Areas containing tungsten occurrences in Chaffee, Fremont, Gunnison, Lake, Larimer, Park, and Summit Counties, Colo.

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Drainage in Gunnison County is by the Gunnison River and its tributaries; in Chaffee, Fremont, and Lake Counties, by the Arkansas River and its tributaries; in Summit County, by tributaries of the Colorado River; in Larimer County, by tributaries of the Big Thompson and Cache La Poudre Rivers; and in Park County, by tributaries of the Arkansas and South Platte Rivers.

Poor-to-good access roads connect most of the properties with all-weather highways. Railroad facilities are available at Climax, Leadville, Salida, Fort Collins and Canon City. Native timber suitable for most mining purposes is plentiful near most of the prospects or can be purchased locally. Electric power service lines are available at only a few mines. Ample labor and housing can be found at Alma, Breckenridge, Canon City, Climax, Fairplay, Fort Collins, Guffy, Gunnison, Lake George, Leadville, and Salida. Wages range from $1.25 to $1.80 an hour. The nearest market for tungsten ores is at Nederland, Colo., and truck hauls to Nederland probably will average 8 cents per ton-mile.

Town	Population in 1950	Distance from railroad, miles	Distance from Nederland, miles	Cost of truck haul to Nederland, per ton
Breckenridge	206	42	87	$ 6.96
Climax	829	0	108	8.64
Canon City	6,345	0	164	13.12
Fairplay	476	36	134	10.72
Guffey	60	26	180	14.40
Gunnison	2,770	66	270	21.60
Lake George	179	36	162	12.96
Leadville	4,081	0	121	9.68
Salida	4,553	0	190	15.20
Fort Collins	14,937	0	69	5.52
Loveland	6,773	0	57	4.56

DESCRIPTION OF TUNGSTEN PROSPECTS

A description of the tungsten-bearing areas is given by county location.

Chaffee County

Four of the five tungsten deposits in Chaffee County lie within areas of pre-Cambrian granites, schists, and gneisses, and the veins follow the schistosity. The other deposit is in an igneous breccia zone. Tertiary intrusive rocks are near each of the deposits. Tungsten occurs as scheelite in both coarse and fine crystals and flakes.

Twelve tungsten claims have been prospected or partly developed (fig. 2). The names, locations, and owners follow:

Map No.	Mine	Location	Owner
1	Calumet	Sec. 26, T. 51 N., R. 9 E.	Carl Harvey.
2	Sage claim	Sec. 24, T. 50 N., R. 9 E.	-
3	Cleora No. 2	Sec. 11, T. 49 N., R. 9 E.	Mining Ventures, Inc.
4	Grand View	Sec. 11, T. 49 N., R. 9 E.	Rainbow Mining Co.
5	Mute lode	Sec. 2, T. 49 N., R. 9 E.	Martin Kenick et al.
6	Hub tunnels	Sec. 2, T. 49 N., R. 9 E.	Gobetti.
7	Stockton	Sec. 10, T. 49 N., R. 9 E.	Rainbow Mining Co.
8	Uncle Andy	Sec. 10, T. 49 N., R. 9 E.	Mining Ventures, Inc.
9	North Star claim	Sec. 10, T. 49 N., R. 9 E.	Martin Kenick et al.
10	Saddle claim	Sec. 15, T. 49 N., R. 9 E.	Do.
11	Poncha Pass claim	Sec. 5, T. 48 N., R. 8 E.	Do.
12	Lucky 2 claim	Sec. 5, T. 48 N., R. 8 E.	Do.

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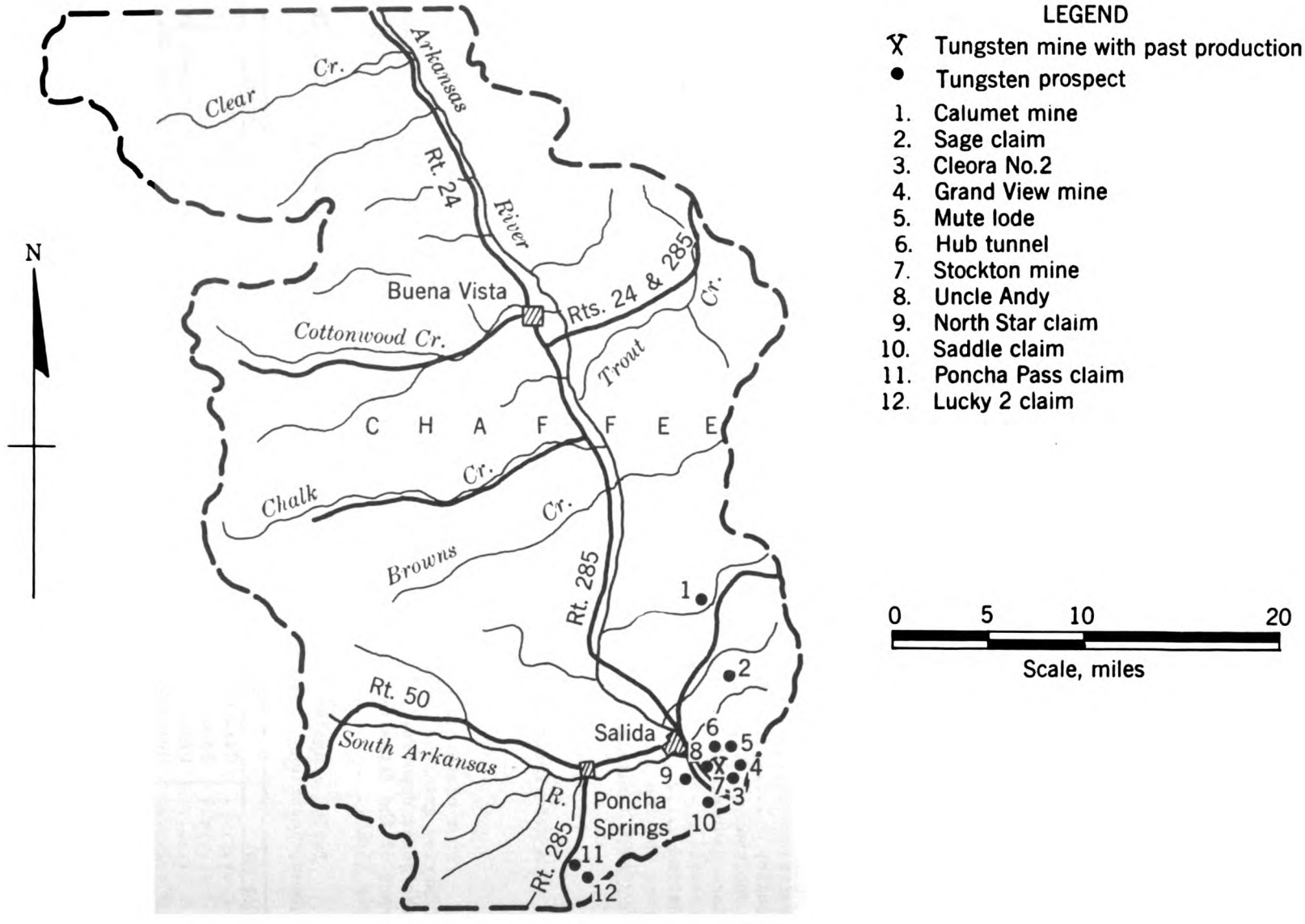

Figure 2. - Location of known tungsten prospects, Chaffee County, Colo.

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Map No.	Mine	Location	Owner
1	Calumet	Sec. 26, T. 51 N., R. 9 E.	Carl Harvey.
2	Sage claim	Sec. 24, T. 50 N., R. 9 E.	-
3	Cleora No. 2	Sec. 11, T. 49 N., R. 9 E.	Mining Ventures, Inc.
4	Grand View	Sec. 11, T. 49 N., R. 9 E.	Rainbow Mining Co.
5	Mute lode	Sec. 2, T. 49 N., R. 9 E.	Martin Kenick et al.
6	Hub tunnels	Sec. 2, T. 49 N., R. 9 E.	Gobetti.
7	Stockton	Sec. 10, T. 49 N., R. 9 E.	Rainbow Mining Co.
8	Uncle Andy	Sec. 10, T. 49 N., R. 9 E.	Mining Ventures, Inc.
9	North Star claim	Sec. 10, T. 49 N., R. 9 E.	Martin Kenick et al.
10	Saddle claim	Sec. 15, T. 49 N., R. 9 E.	Do.
11	Poncha Pass claim	Sec. 5, T. 48 N., R. 8 E.	Do.
12	Lucky 2 claim	Sec. 5, T. 48 N., R. 8 E.	Do.

These claims are described in more detail below:

Calumet Mine

A prospector-miner from Park County has reported that scheelite occurs on the Calumet iron property in Railroad Gulch. This occurrence and another one-half mile farther up Railroad Gulch could not be verified by examination because the exact area of the scheelite was not known. No tungsten ore has been shipped. This mine was operated before 1900 for iron but was abandoned and allowed to cave. Small veins occur in a porphyry stock of Tertiary age.

Sage Claim

The Sage claim is on a long ridge 4 airline miles northeast of Salida but 18 miles by road at an estimated altitude of 8,200 feet. Scheelite occurs with low-grade manganese material in a north-striking igneous breccia of Tertiary age. The breccia zone is 30 to 40 feet wide and can be traced several hundred feet. The manganese is in the form of psilomelane with cemented quartz and calcite. Development consists of a surface cut and a small pit. A 14-foot sample reportedly (1)[2/] assayed 12 percent manganese and 0.67 percent WO_3. No tungsten ore has been shipped.

Cleora No. 2

This tungsten prospect is 3-1/2 miles southeast of Salida on the east side of Longfellow Gulch at an altitude of about 7,100 feet. A vein 1 to 4 feet wide strikes N. 70° E., dips 63° NW. and can be traced on the surface for several hundred feet. The vein has been explored by a 150-foot adit. Vein filling is mostly broken schist and quartz. Three low-grade scheelite zones were penetrated, each 15 to 20 feet long. No production has been made.

Grand View Mine

The Grand View mine prospect is about 3 miles downstream from Salida on the northeast side of the Arkansas River at altitudes between 7,030 and 7,400 feet. The property is developed by seven adits and a shaft. Adit 1 is 25 feet above the railroad and has been driven 115 feet through diorite. It follows a narrow seam of soft, barren schist. Adit 2 is 150 feet above adit 1 and has been driven N. 35° E. for 170 feet through somewhat cemented surface wash, with occasional layers of crushed quartz containing specks of scheelite. Adits 3 and 4 are 50 and 100 feet

2/ Underlined numbers in parentheses refer to items in the bibliography at the end of the report.

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long and 30 to 50 feet above and west of adit 2; they were driven into blocky diorite. Adit 5 is at the same elevation as adit 4 and is caved. The quartz vein strikes N. 85° E., dips 56° N., and contains iron and oxidized-copper stains. Adit 16 is 16 feet long and exposes partly oxidized, copper-stained quartz. Adit 7 is 60 feet long and heavily timbered. The shaft is caved. The mine was worked as a copper prospect from 1890 to 1905. The scheelite-bearing zones are extremely weak. No tungsten ore has been produced.

Mute Lode

The Mute-lode prospect is about 4 miles southeast of Salida on the easterly branch of Hub Gulch at an altitude of about 7,540 feet. A trail 1 mile long connects the property with a secondary road. An adit 150 feet long follows a 4-inch vein of broken schist and quartz. This vein strikes N. 70° E., dips 63° NW. and contains copper carbonate stains and specks of scheelite. No tungsten ore has been produced.

Hub Tunnels

The lower Hub tunnel is about 4 miles southeast of Salida and three-fourths of a mile up Hub Gulch at an elevation of about 7,500 feet. A trail three-quarters of a mile long connects the property with a secondary road. A 20-foot adit follows a 4-inch quartz vein showing copper carbonate stains. A vein west of the portal is exposed in a small cut and is traceable for 100 feet on surface. This vein strikes N. 80° E. and dips 75° SE. Three samples from this vein reportedly (5) averaged 1.08 percent WO_3 for a width of 1.2 feet. The upper Hub tunnel is 40 feet above and 50 feet to the east of the lower tunnel and is caved 15 feet from the portal; it exposes an 18-inch quartz vein containing green copper stains and a little scheelite. No tungsten ore has been produced.

Stockton Mine

The Stockton mine is 3 miles southeast of Salida on the north side of the Arkansas River at an altitude of 7,050 to 7,400 feet. The property contains 9 northeasterly striking veins, which have been developed by about 1,500 feet of workings. The Stockton vein has been opened by 2 adits, 500 and 600 feet long, and a shaft with 3 short levels. The Gertrude vein is opened by a 125-foot adit. The Denver & Rio Grande Western Railroad passes within 300 yards of the property, and service lines of the Public Service Co. of Colorado are nearby.

The mine was first worked in the 70's, and the tunnels were driven to cut a surface copper showing at depth. The occurrence of scheelite was recognized during World War I. The Stockton vein strikes N. 83° E., parallel to the schistosity of pre-Cambrian granite, and dips 83° SE. The vein is pegmatitic in character, with granular quartz, feldspar, hornblende, and biotite. Surface rocks are highly altered. Scheelite occurs in crystals, some being comparatively large. Copper is present as chrysocolla and cuprite. The gangue is a mixture of quartz, hornblende, biotite, chlorite, calcite, tourmaline, and apatite.

Facilities at the mine consist of a small shop building and a mine car, and track. Although the occurrence of scheelite was recognized during World War 1, according to A. J. Posselt, one of the owners, the total production of tungsten amounts to about 2 tons of ore valued at $110.00, which was shipped during World War II. The mine contains a few tons of ore reserves.

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Uncle Andy

The Uncle Andy prospect is 3 miles southeast of Salida near the mouth of Hub Gulch at an altitude of about 7,100 feet. Workings consist of a caved adit, which has been reported (5) as containing scheelite ore. The dump shows oxidized copper minerals. No shipments of tungsten ore have been made.

North Star Claim

The North Star prospect is 2 miles southeast of Salida on U. S. Highway 50. The vein, striking east-west and dipping 40° N., is exposed in a cut on the highway. The vein contains crushed schist and quartz and a little scheelite. Little development work has been done. No tungsten ore has been produced.

Saddle Claim

This prospect is 2.5 miles below Salida on the southwest side of the Arkansas River. The scheelite occurrence is in a 50-foot fracture zone in decomposed diorite impregnated with copper minerals and a little scheelite. Development consists of 11 shallow pits. The dumps, containing 40 to 50 tons, reportedly (5) assay 0.4 percent WO_3. Additional development work could be done by bulldozing. No tungsten ore has been shipped.

Poncha Pass Claim

The Poncha Pass claim is 12 miles west of Salida near Poncha Pass at an elevation of about 9,000 feet. The scheelite prospect occurs in a vein 2 feet wide striking N. 90° E., with a vertical dip in pre-Cambrian greenstone schist. The vein is developed by a short surface cut. A sample of the vein reportedly (5) assayed 0.17 percent WO_3.

Lucky 2 Claim

The Lucky 2 claim is 12 miles west of Salida and 1,500 feet from the Poncha Pass claim at an altitude of about 9,050 feet. The prospect, occurring as a quartz vein in pre-Cambrian metamorphic rocks, strikes northwest and dips 80° NE. A 15-foot cut exposes the vein, which contains spots of low-grade scheelite and is traceable on the surface for 60 feet to the northwest. A 1-inch, high-grade scheelite streak in the bottom of the adit reportedly (1) was almost pure scheelite. No tungsten ore has been shipped.

Fremont County

Tungsten occurrences as scheelite have been found in veins in pre-Cambrian granites, schists, and gneisses that have been intruded by pegmatite masses. The occurrences are south of Guffey, Park County, in an area about 12 miles long and 7 miles wide containing steeply dipping schists. Small crystals, flakes, grains, and coatings of scheelite occur in nearly vertical lime-silicate beds in schists and are associated with garnet, quartz, epidote, and calcite. In Phantom Canyon tungsten occurs as wolframite in small veins in pre-Cambrian granite.

Near the head of Copper Creek scheelite has been found in lenses in a dikelike mass of pre-Cambrian granite containing hornblende.

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Six tungsten deposits have been partly prospected or developed (fig. 3). The names, locations, and owners follow:

Map No.	Mine	Location	Owner
1	Nipple Mountain Prospect	Sec. 21, T. 16 S., R. 69 W.	Abandoned.
2	Bond Ranch	Sec. 10, T. 17 S., R. 69 W.	Edward Roberts.
3	Venture No. 1 claim	Sec. 29, T. 16 S., R. 72 W.	Mining Ventures, Inc.
4	Charlene No. 1 claim	Secs. 3 & 10, T. 16 S., R. 73 W.	George E. West et al.
5	Four Claim group	Secs. 24 & 25, T. 16 S., R. 73 W.	Kellogg & Green.
6	Oliver Prospect	Sec. 24, T. 19 S., R. 73 W.	Abandoned.

A brief description of the prospects is given below.

Nipple Mountain Prospect

Small veins containing wolframite in pre-Cambrian granite were found in the early 1900's on the east slope of Nipple Mountain in northeastern Fremont County, which is accessible from Phantom Canyon. The property, reached by trail from the Phantom Canyon road, has been developed by a few shallow pits. The center of Nipple Mountain appears to be a small stock of phonolite. No production has been recorded, and the prospect has been abandoned.

Bond Ranch Mine

The Bond Ranch mine is on the east side of Eight Mile Creek in Phantom Canyon and 22 miles from Canon City over State Highway 67; the altitude is about 7,000 feet. Tungsten occurs as wolframite in small veins in pre-Cambrian rocks. During World War I, 1,800 pounds of ore containing 58 percent WO_3 reportedly was shipped from the property by Clarence Bond; and during World War II, 400 pounds of high-grade ore was mined. The property is developed by an adit, which according to local prospectors is 1,200 feet long.

Venture No. 1 Claim

The Venture No. 1 claim was located in 1953 on the west side of Currant Creek; a poor access road about 1 mile long connects the property with State Highway 9, from whence it is 15 miles to U. S. Highway 50 and 25.4 miles to Canon City. The prospect is at an altitude of 7,900 feet and is 10 feet wide at the discovery shaft. The ore mineral is scheelite, which occurs in altered lime-silicate beds in pre-Cambrian schist striking N. 20° W. and dipping nearly vertical. The mineralized zone can be traced up the hill to the northwest for 800 feet. The scheelite occurs mostly as thin flakes and is associated with considerable garnet and quartz. The property is developed by a 10-foot discovery shaft and 6 shallow trenches. No production has resulted.

Charlene No. 1 Claim

This prospect is on the north side of Cottonwood Creek, a tributary to Currant Creek, at an altitude of 7,800 feet. A 4.1-mile access road connects the mine with State Highway 9, from whence it is 18 miles to U. S. Highway 50 and 27.4 miles to Canon City. Tungsten occurs as small crystals, flakes, grains, and thin coatings

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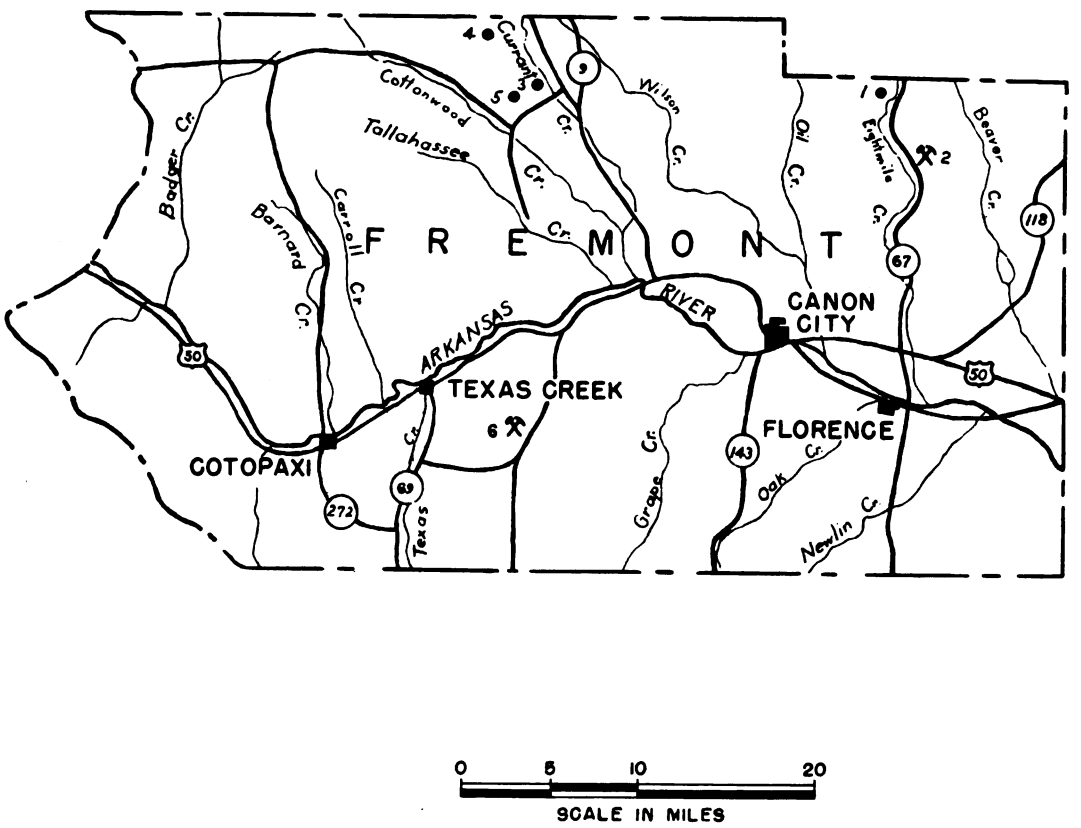

LEGEND

- TUNGSTEN MINE WITH PAST PRODUCTION
- TUNGSTEN PROSPECT
- 1 NIPPLE MOUNTAIN PROSPECT
- 2 BOND RANCH MINE
- 3 VENTURE NUMBER 1 CLAIM
- 4 CHARLENE NUMBER 1 CLAIM
- 5 FOUR CLAIM GROUP
- 6 OLIVER PROSPECT

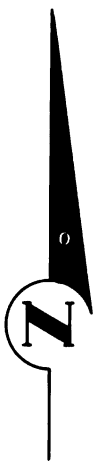

Figure 3. - Location of known tungsten prospects, Fremont County, Colo.

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of scheelite, associated with garnet, quartz, epidote, and calcite in steeply dipping, lime-silicate beds with pre-Cambrian schist. The mineralized zone is 3 to 13 feet wide and can be traced for 1,500 feet. It is developed by a surface cut 12 feet wide and 35 feet long and a 33-foot adit driven into the hill 25 feet below the surface cut. The owner also has four other claims (Charlene Nos. 2, 3, 4, and 5) located end-to-end north of claim 1. Claim 2 has been developed by a small pit made with a bulldozer. Facilities consist of a small orehouse on claim 1. The prospect is low-grade, and no tungsten shipments are known to have been made.

Four Claim Group

The Four Claim group is on the north side of Smith Gulch about 4 miles from Currant Creek at an altitude of 8,100 feet. A fair access road three-quarters of a mile long connects with a county road in Smiths Gulch, from whence it is 3 miles to State Highway 9, 16 miles to U. S. Highway 50, and 25.4 miles to Canon City. The country rock is pre-Cambrian granite, schist, and gneiss penetrated by pegmatite masses. The ore mineral is scheelite, which occurs as small crystals, flakes, grains, and thin coatings associated with garnet, quartz, epidote, and calcite in lime-silicate beds within the steeply dipping schist. The deposit has a northerly strike and dips steeply westward. The discovery cut crosses the deposit and exposes 10 feet of altered material containing a small amount of scheelite. Four claims have been located end to end. Bulldozer cuts have been made on the three other claims. No shipments have been made.

Oliver Prospect

The Oliver prospect is near the head of Copper Creek at an altitude of 7,900 feet. A fair access road 8 miles long connects the property with State Highway 69, from whence Texas Creek, on U. S. Highway 50, and the Denver & Rio Grande Western Railroad are 5 miles distant. The country rock is pre-Cambrian schist and granite. The ore occurs as lenses containing scheelite in a dike that is predominantly hornblende. Four tons of 2-percent ore was produced in 1942. Development consists of several shallow pits, the largest of which is 6 feet wide and 15 feet deep. The property has been abandoned.

Gunnison County

In the Gold Hill area 45 miles northeast of Gunnison hübnerite-bearing veins occur in pre-Cambrian gneissic quartz-monzonite. Northeast and southwest of the area are early Tertiary stocks of quartz-monzonite porphyry, which are about 6,500 feet apart. On the east side of the small east stock is the strong Tincup fault, which strikes about N. 20° W. and dips 40° SW. On the east side of the west stock is a second, strong northwesterly trending fault; on the west side of the Ida Mae mine is a third northwesterly striking fault. Most of the veins are short (300 to 1,000 feet). Molybdenite mineralization is considered earlier than tungsten mineralization, and where both metals are present the tungsten has been found in a separate quartz streak. All the tungsten veins except the Complex strike northeastward. The tungsten ores contain hübnerite, with minor amounts of scheelite and powellite. Molybdenite, chalcopyrite, and pyrite frequently are present.

In the White Earth district 23 miles southwest of Gunnison the country rock consists of pre-Cambrian schists and gneisses, hornblende gneiss, and Aberdeen (?) granite cut by middle Tertiary rhyolite and quartz-latite intrusions; in places the surface is covered by late Tertiary andesite-basalt and rhyolite flows. Tungsten appears to be on or near contacts. The ore mineral is scheelite, associated with quartz, talc, and epidote in altered massive hornblende gneiss.

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Seven tungsten properties have been prospected (fig. 4); the name, location, and owner follow:

Map No.	Mine	Location	Owner
1		Gold Hill area	
1	Hübnerite mine	SW1/4sec. 32, T. 15 S., R. 81 W.	Unpatented; A. L. and B. Pearson.
2	Ida Mae mine	SE1/4sec. 11, T. 51 N., R. 4 E.	Gunnison Bank & Trust Co. and B. Pearson.
3	Occident prospect	NE1/4sec. 15, T. 51 N., R. 4 E.	Olive Wilson.
4	Molybdenite Extension	NW1/4sec. 14, T. 51 N., R. 4 E.	Unpatented; no recent assessment work filings.
5	Complex mine	Sec. 23, T. 51 N., R. 4 E.	H. R. Coster.
		White Earth district	
6	Kezer No. 2 prospect	Sec. 19, T. 48 N., R. 2 W.	Unpatented; Thompson & Douglas.
7	Lilly Belle	Sec. 30, T. 48 N., R. 2 W.	Unpatented; Lillie Mo Osgood et al.

Hubnerite Mine

The Hübnerite mine is on the north slope of Gold Hill at an altitude of 11,700 feet and about 13 miles from Pitkin by road. The property contains three known hübnerite veins striking N. 25° E. and dipping northwest. The vein in the lower adit is 5 feet wide where cut, but it contains very little hübnerite. A streak of white quartz, pyrite, galena, and copper minerals is part of the vein. To the northeast a fourth parallel vein has been developed by workings consisting of two short adits and several old pits and shallow shafts. Specimens on the dumps indicate that the tungsten streaks are 4 to 8 inches wide. Equipment at the property consists of a mine car and 100 feet of track. Hübnerite can be found on all the dumps. The mine was worked for gold-silver-copper-lead ore in the early 70's but was worked for tungsten during both world wars. Total production is estimated at 100 units. Some exploration work was done in 1953, with the assistance of the Defense Minerals Exploration Administration.

Ida Mae Mine

The Ida Mae mine is on top of Gold Hill just west of Cumberland Pass at an altitude of 12,055 feet. It is about 12 miles from Pitkin by road. According to Ogden Tweto (8), 15 veins have been mapped in the area, of which at least 7 are tungsten-bearing. The tungsten veins have strikes ranging from N. 10° E. to N. 70° E. The country rock is pre-Cambrian quartz-monzonite. Veins range from 1 to 3 feet in width and a quartz-hübnerite streak 2 to 6 inches wide occurs along 1 wall. Float on the side hill indicates that the hübnerite streaks may be as wide as 18 inches. Hübnerite is found on the dumps of many workings and in the large talus deposit on the north side of the hill. Workings consist of a 60-foot shaft, a crosscut adit, and a number of pits and short drifts - all caved or partly caved. There was no equipment on the property at the time of the inspection, but a small power shovel was put into operation digging trenches shortly afterward. The property was first operated for gold, silver, copper, and lead, and it is reported that $18,000 worth of these metals was shipped. During World War I about 60 tons of 11 percent WO_3 ore valued at $16,000 was produced. A. L. Pearson states that since

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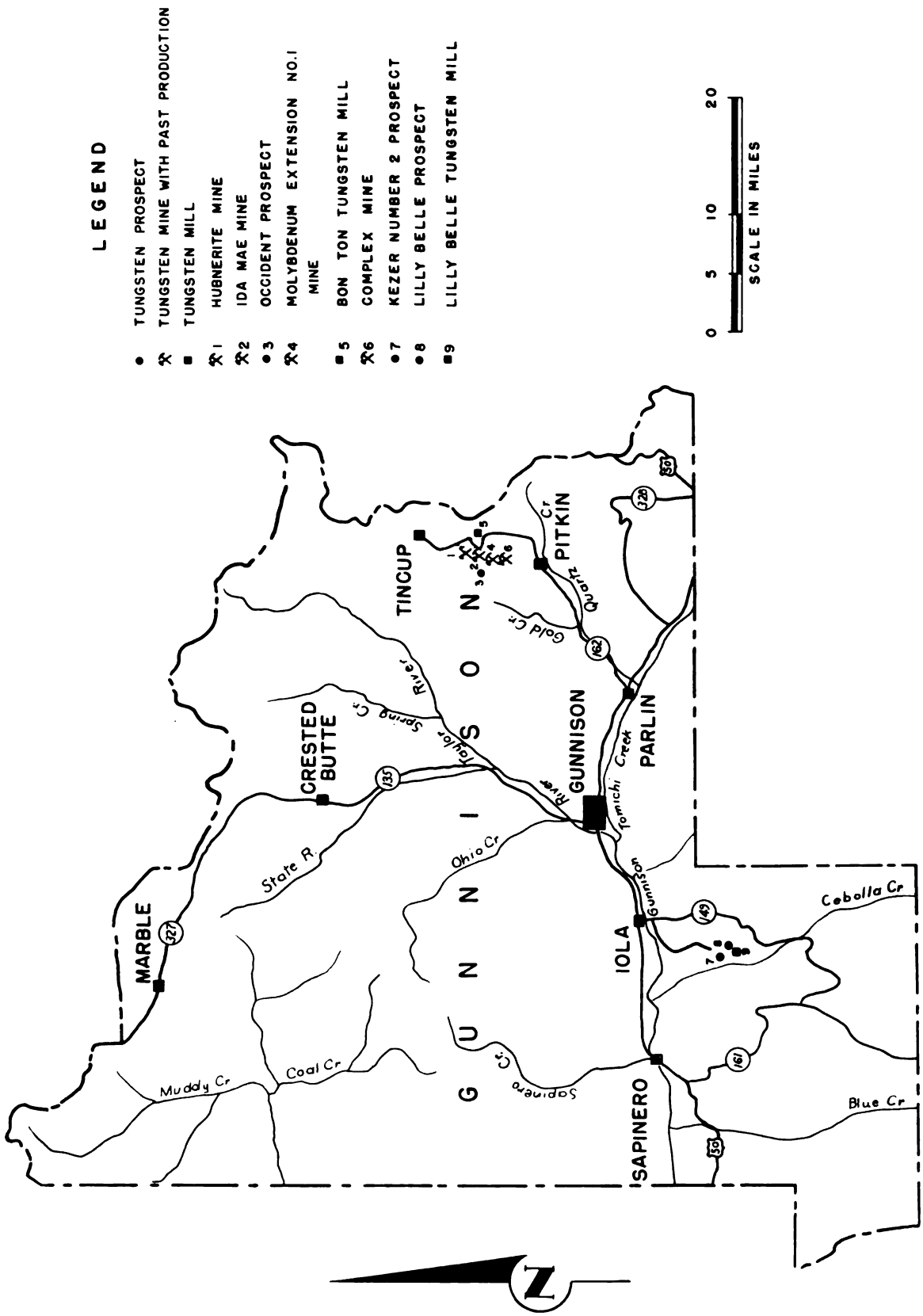

Figure 4. - Location of known tungsten prospects, Gunnison County, Colo.

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that time a lessee has produced ore valued at $69,910. The Mesa Verde Uranium Co. planned to operate during 1954, but production has not as yet been reported.

Occident Prospect

The Occident prospect is about 3,900 feet southwest of the Ida Mae at an altitude of 11,690 feet. An 18-inch vein strikes N. 22° E. through pre-Cambrian quartz-monzonite and dips 75° NW. A 6-inch streak of hübnerite-bearing quartz is on the hanging wall. The footwall side of the vein contains pyrite and chalcopyrite that reportedly carry considerable silver. The property is developed by a 300-foot crosscut adit and 15 feet of drift on the Occident vein. No ore has been produced.

Molybdenite Extension No. 1

This mine is at an elevation of 11,825 feet and is about 1,400 feet southwest of the Ida Mae shaft. A 2- to 4-foot vein strikes N. 55° E. through pre-Cambrian quartz-monzonite and dips 60° NW. The tungsten streak, 4 to 12 inches wide, is near the center of the vein, which also contains gouge, molybdenum-bearing quartz, and minor amounts of pyrite, chalcopyrite, and galena. The workings consist of a 20-foot shaft, a surface trench, and a few shallow holes. Reportedly, 10 tons of 20-percent WO_3 concentrate (8) has been produced from 100 tons of ore by rough jigging and tabling.

Complex Mine

The Complex mine is on the west side of North Quartz Creek at an altitude of 11,500 feet. It is about 8 miles north of Pitkin by road. The vein comprising 3 zones, strikes N. 60° W. through pre-Cambrian quartz-monzonite and dips 55° SW. The footwall zone is up to 18 inches wide and contains quartz and hübnerite; the remaining 2 zones contain lead, zinc, copper, and silver. Workings consist of a 300-foot crosscut adit, 400 feet of drifting, and old upper workings with a 200-foot inclined shaft. The lower workings are not accessible. Some hübnerite can be found in the dumps. The Complex is an old mine worked in the 90's and during World War I for gold, silver, and lead and during World War II for tungsten. Production is estimated at 500 units.

Kezer No. 2 Prospect

The Kezer No. 2 is a prospect in the White Earth district about 12 miles southwest of Iola at an altitude of about 8,200 feet. The vein, which has an andesite footwall and a chloritized schist hanging wall, is 6 feet wide, strikes northeast, and dips about 45° SE. The vein filling is altered country rock with some quartz, scheelite, and powellite. Tungsten mineralization is greater near the hanging wall. The current operators state that they can upgrade the ore to 4 percent WO_3 by hand sorting. The mineral zone can be traced 300 feet on surface. Workings consist of a 20-foot adit driven on the vein. No production has come from the property.

Lilly Belle Prospect

The Lilly Belle prospect is about 12 miles southwest of Iola at an altitude of 8,400 feet. The property is about one-half mile southeast of the Kezer No. 2. Mineral is found on the surface in front of the blacksmith shop and to the northeast on the other side of a small hill. Surface workings consist of several pits and trenches that do not appear to be on any particular geologic structure. In the immediate vicinity of the workings the country rock is pre-Cambrian granite, hornblende, gneiss, and Tertiary rhyolite. Underground acidic igneous rock

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(rhyolite?) is in contact with hornblende gneiss. A large talc streak, carrying scheelite, cuts through the hornblende gneiss and may be related to a fairly strong northwesterly striking fault. The talc streak could not be examined in detail because of the presence of bad air.

The property is developed by a 120-foot incline and 270 feet of gridlike drifts or crosscuts on a single level at the bottom of the incline. Workings in altered hornblende schist are closely timbered and lagged. Facilities consist of a compressor house, office building, shop, hoist house, snow sheds, and mill building. Equipment includes a gasoline-engine-driven compressor, gasoline-engine-driven winch-type hoist, heavy, well-laid track, mine cars, air fan, jackleg machine, 10- by 16-inch Universal crusher, small rolls, and magnetic pulley. The operators ran about one-half ton of ore through the mill and then closed down. Scheelite crystals up to 4-1/2 pounds in weight were found on the surface.

Lake County (2, 11, 12)

The only known occurrence of tungsten ore in Lake County is at Climax, where wolframite is recovered as a byproduct in mining molybdenite. The country rock at Climax is pre-Cambrian granite and schist cut by dikes of Tertiary quartz-monzonite porphyry. The mineralized area is roughly bounded on the west by the Mosquito fault, which strikes N. 10° E. and dips 71° NW. and on the east by a strong fault which dips about 50° SE. These 2 faults are about 3,400 feet apart on the Phillipson level. Between the 2 faults are many minor faults and shear zones striking from N. 10° E. to N. 80° E. and dipping 50° to 60° SE. The Mosquito fault cuts the Tertiary dikes and has a large displacement. Pre-Cambrian granite is on the east side of the fault in the vicinity of Climax, and Carboniferous sedimentary formations are along the west side. On the Phillipson level the fault zone consists of a breccia zone 125 feet thick with broken zones in the country rock on both sides for an additional 100 feet. Fault movement was both premineralization and postmineralization. The ore deposit is roughly in the form of an outer ring of a truncated cone. On surface the area is marked by a highly colored outcrop of rather intensive alteration, somewhat eliptical in shape with axes roughly 2,000 feet and 3,000 feet long. Toward the center of the deposit is a highly silicified, irregular core. The outer zone grades from slightly altered granite into unaltered granite and contains small, crisscrossing, replacement veinlets of quartz with molybdenite, and some fluorite and pyrite. The veinlets decrease in number toward the outer edge of the mineralized zone. In the central core the veinlets become larger, and the mass contains more quartz with less metallic content. Veinlets of the later quartz, containing wolframite, range from small seams to streaks up to 1 inch wide.

The Climax mine of the Climax Molybdenum Corp. is in sec. 12, T. 8 S., R. 79 W., 13 miles north of Leadville, at an altitude of 11,320 feet (fig. 5). The mine is developed by several adits, the most important of which are the Phillipson and Storke. Ore is mined by modified block-caving methods. Ore cars are loaded from overhead slusher drifts. Mine workings and equipment are commensurate for a large progressive operation, which produced 6,604,857 tons of ore in 1953. The company is the second largest industrial consumer of electrical energy in the State.

Although the Climax mine is a molybdenum mine and tungsten is recovered only as a byproduct, the 1953 production of tungsten from Climax was 50.08 percent of the entire 1953 Colorado production.

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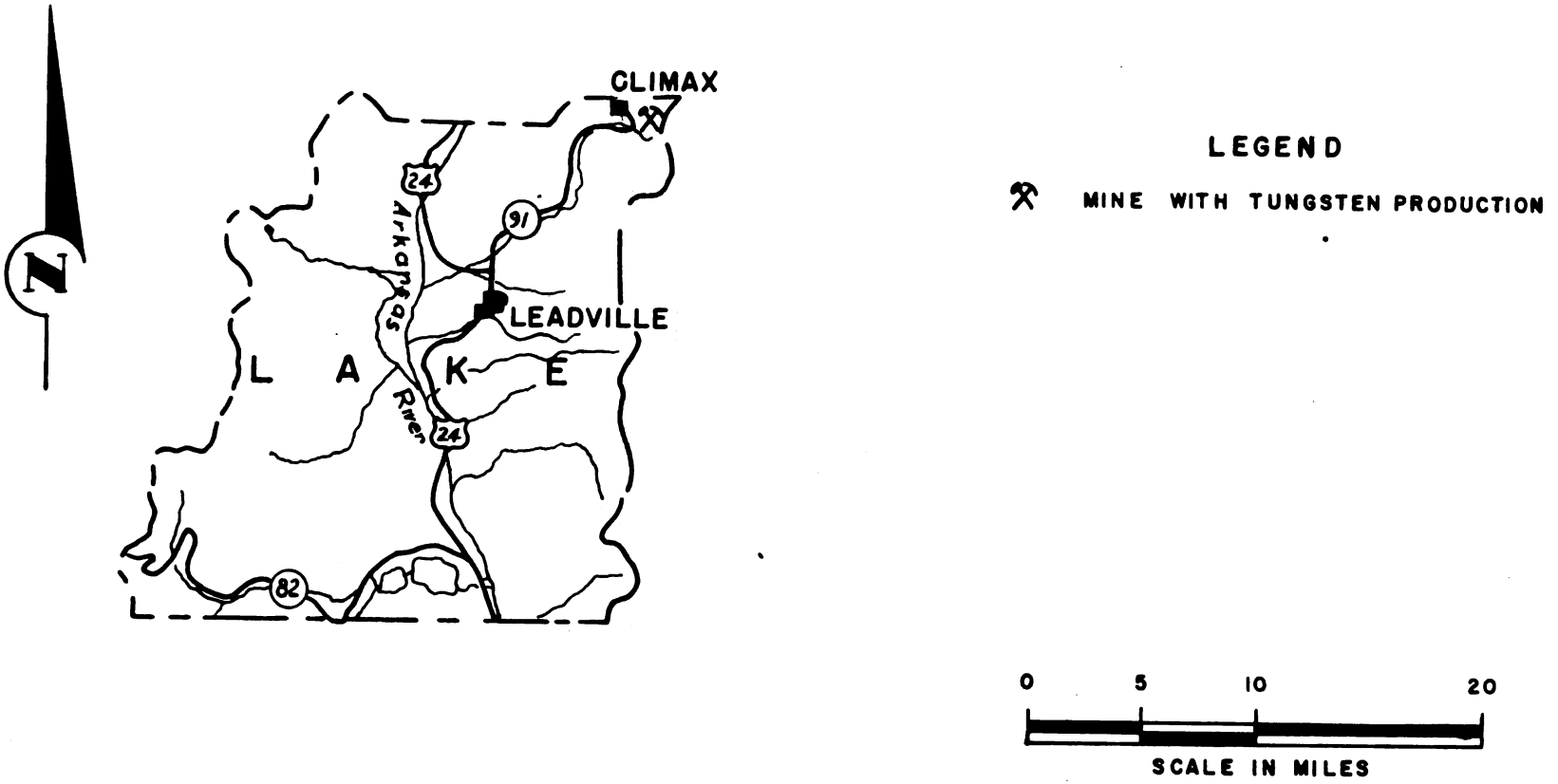

Figure 5. - Location of Climax mine, Lake County, Colo.

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Larimer County

The tungsten mines lie within an area of pre-Cambrian granite, schists, and gneisses, which have been intruded by pegmatite masses and both acidic and basic igneous dikes. There are 2 prominent fracture systems; 1 trending northwestward is mostly barren of tungsten minerals, and the other, which trends northeastward, contains all the known scheelite deposits.

Two northwesterly trending faults, known as the Buckhorn and Redstone, can be traced several miles and are apparently related to the tungsten deposition. These faults are a single fault south of Masonville, separating to the northwest into two faults and becoming as much as 1 mile apart. These features and the mine locations are shown on figure 6.

Seven discoveries have been prospected or developed to some extent (fig. 6); the names, locations, and owners follow:

Map No.	Mine	Location	Owner
1	Green Rock	Secs. 26 & 35, T. 9 N., R. 71 W.	Clifford Woodhames.
2	Spaulding	Sec. 35, T. 9 N., R. 71 W.	C. G. Spaulding.
3	Lookout	Secs. 22 & 23, T. 8 N., R. 72 W.	T. H. Sacket et al.
4	Challenger	Secs. 23 & 24, T. 8 N., R. 72 W.	Do.
5	Ball Scheelite	Sec. 21, T. 7 N., R. 70 W.	Florence Ball.
6	Carter tunnel	Sec. 10, T. 6 N., R. 70 W.	Unknown.
7	Mason Ranch	Sec. 9, T. 6 N., R. 70 W.	J. W. Livingston.

These deposits are described in more detailed below:

Green Rock Mine

The Green Rock mine is about 2 miles north of the Columbine summer camp on State Highway 14. The property consists of one unpatented claim.

The deposit is on an east-west trending vein in quartz-biotite-schist 6 feet wide. Scheelite occurs in the vein, as evidenced by a Mineralight.

Mine development consists of a 30-foot shaft and 2 short adits. Production in 1942 was about 50 tons of ore, assaying about 1 percent WO_3.

Spaulding Mine

The Spaulding mine is east of the Green Rock mine and consists of one unpatented claim. Scheelite occurs as small crystals in quartz-biotite-schist stringers. Garnet and other contact metamorphic minerals are present.

This mine was originally worked to developed small showings of copper and graphite. Workings consist of 2 adits 50 and 60 feet long. The property was being operated in the early months of 1954, and all mine workings are in good condition. No shipments have been made.

Lookout Mine

The Lookout mine is in the extreme northwest corner of the area about 1-1/2 miles by road northwest of the Challenger mine and 30 miles northwest of Fort Collins. The property consists of one unpatented claim, which was leased in the early part of 1954. This mine has had the largest production of any in Larimer County.

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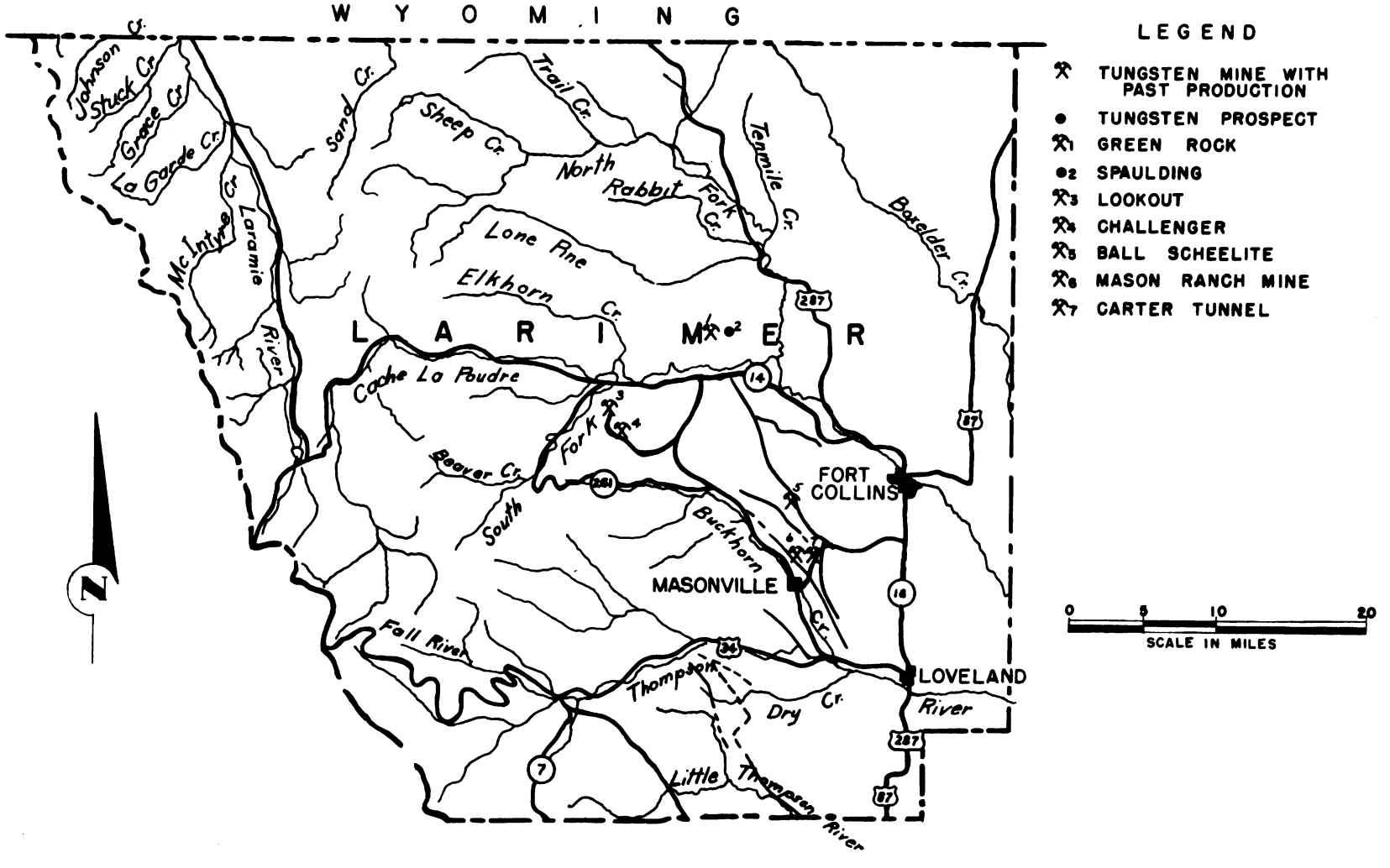

Figure 6. - Location of known tungsten prospects, Larimer County, Colo.

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The tungsten occurs in a mineralized zone 10 to 15 feet wide. Development consists of a trench 200 feet long, 20 feet wide, and 10 feet deep. Over 100 tons of ore, averaging almost 2 percent WO_3, was shipped from surface workings between September 1952 and May 1953.

A small ore house is the only facility on the property.

Challenger Mine

The Challenger mine is in the northwest corner of the area. The Buckhorn fault, if projected to the northwest, might pass through the mine. One claim, the Heline No. 1, was located in 1932 and was relocated as the Challenger in 1951.

The deposit consists of a quartz-filled vein striking northeast in quartz-biotite-schist with other contact metamorphic minerals. The mineralized zone can be traced for 300 feet on the surface. A north-south acidic dike is intersected by the main workings.

The property is developed by a 20-foot and a 10-foot shaft and 9 shallow pits about 6 feet deep. The deeper shaft is in poor condition. A few tons or ore averaging 0.57 percent WO was shipped to a mill in Boulder County in 1942.

Ball Scheelite Mine

The Ball Scheelite mine is about 6 miles by road north and west from Masonville. The property comprises one claim held by location. The deposit is on the Redstone fault, which is about 3 feet wide and crops out for 150 feet. This fault has been traced for 15 miles.

Development consists of five adits at different elevations, all of them caved at the portal. Drifting is reported to aggregate about 300 feet. No production resulted from the work.

Carter Tunnel

The Carter tunnel is about 1 mile by road north of Masonville. The mine was worked before 1920 for gold. The property comprises three standard, unpatented mining claims, and the ownership is unknown.

Several small, quartz-filled veins striking northeastward have been drifted on from a crosscut tunnel 550 feet long. Scheelite was observed on the walls of the veins with the aid of the Mineralight.

There are no facilities at the mine, and no production is recorded.

Mason Ranch Mine (7)

The Mason Ranch property consists of 1,350 acres of agricultural patented land about 2 miles north of Masonville, which was worked for gold about 1915. A vein 6 to 48 inches wide near the Buckhorn fault has been traced for 85 feet. Development consists of a 122-foot, inclined shaft and a 960-foot adit which crosscuts the area 150 feet below the shaft. About 200 feet of drifting reportedly (7) was done from the adit in search of gold, and stoping from the shaft resulted in its caving at the collar. The portal of the adit is also caved.

The property has a small tungsten production. Scheelite occurs in flakes as observed under a florescent light in the mineralized zone.

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An old frame building, which formerly housed a gold mill, still stands on the property.

Park County

The known tungsten deposits, with one exception, are in three districts - the Alma, the Tarryall Springs, and the Guffey. In the north Alma district the tungsten-bearing veins are in pre-Cambrian granites or quartz-monzonite gneiss cut by igneous dikes of quartz monzonite and Lincoln porphyry of Tertiary age. Tungsten occurs as wolframite and hübnerite. In the Tarryall Springs and Guffey districts the country rock is pre-Cambrian schists and gneisses, and scheelite occurs as small crystals, grains, flakes, and coatings in nearly vertical lime-silicate beds which follow the schistosity and contain garnet, epidote, chlorite, and quartz. In the Tarryall Springs area the pre-Cambrian schists contain three northeasterly trending fingers called the Fire Fly, Round Mountain, and Badger Mountain belts, along which many scheelite prospects have been located.

Twenty-eight tungsten occurrences have been mined or developed to some extent, and a small amount of tungsten ore has been produced from at least four of the properties (fig. 7). The names, locations, and owners follow:

Map No.	Mine	Location	Owner
1	Wheeler	Sec. 9, T. 8 S., R. 78 W.	-
2	Andes	Sec. 14, T. 8 S., R. 78 W.	G. L. Colburn.
3	Sweet Home	Sec. 33, T. 8 S., R. 78 W.	E. C. Spray
4	Bowers Ranch	Sec. 32, T. 10 S., R. 77 W.	
5	Nix group	Sec. 6, T. 11 S., R. 72 W.	Ben Nix.
6	Pedro No. 1 and No. 2	Sec. 2, T. 12 S., R. 73 W.	W. H. Childress et al.
7	Hallie	Sec. 36, T. 11 S., R. 73 W.	Do.
8	St. Joe group	Secs. 6 & 7, T. 12 S., R. 72 W.	Rocky Mountain Tungsten Corp.
9	Scheelite No. 1 and No. 2	Sec. 30, T. 11 S., R. 72 W.	A. E. Woodward.
10	Badger group	Sec. 32, T. 11 S., R. 72 W.	H. H. Moses and Hendrick.
11	Dorothy group	Secs. 27 & 34, T. 11 S., R. 72 W.	Rocky Mountain Tungsten Corp.
12	Victory group	Sec. 3, T. 12 S., R. 72 W.	Do.
13	Round Mountain group	Secs. 3 & 10, T. 12 S., R. 72 W.	Round Mt. Mining Co., Inc.
14	Little Abner	Sec. 10, T. 12 S., R. 72 W.	Do.
15	Wilfley group	Sec. 10, T. 12 S., R. 72 W.	Robert Wilfley.
16	Jefferyes group	Secs. 1 & 2, T. 12 S., R. 72 W.	Lynn Jefferyes.
17	Jasper Queen	Sec. 11, T. 12 S., R. 72 W.	Consolidated Tungsten Corp.
18	Abel Mineral Land	Sec. 15, T. 12 S., R. 72 W.	J. C. Abel
19	Holmes Ranch	Sec. 15, T. 12 S., R. 72 W.	-
20	Gilley Ranch	Sec. 32, T. 11 S., R. 71 W.	Clyde Gilley
21	B & G. claim	Sec. 25, T. 14 S., R. 74 W.	Mining Ventures, Inc.
22	School Section prospect	Sec. 36, T. 14 S., R. 74 W.	State of Colorado.
23	Copper King		
24	West Ranch	Secs. 23 & 24, T. 15 S., R. 73 W.	G. D. West.
25	Skinney claim	Sec. 24, T. 15 S., R. 73 W.	G. D. West et al.
26	Nash Ranch		
27	Johnson Ranch		
28	Townsend Ranch		

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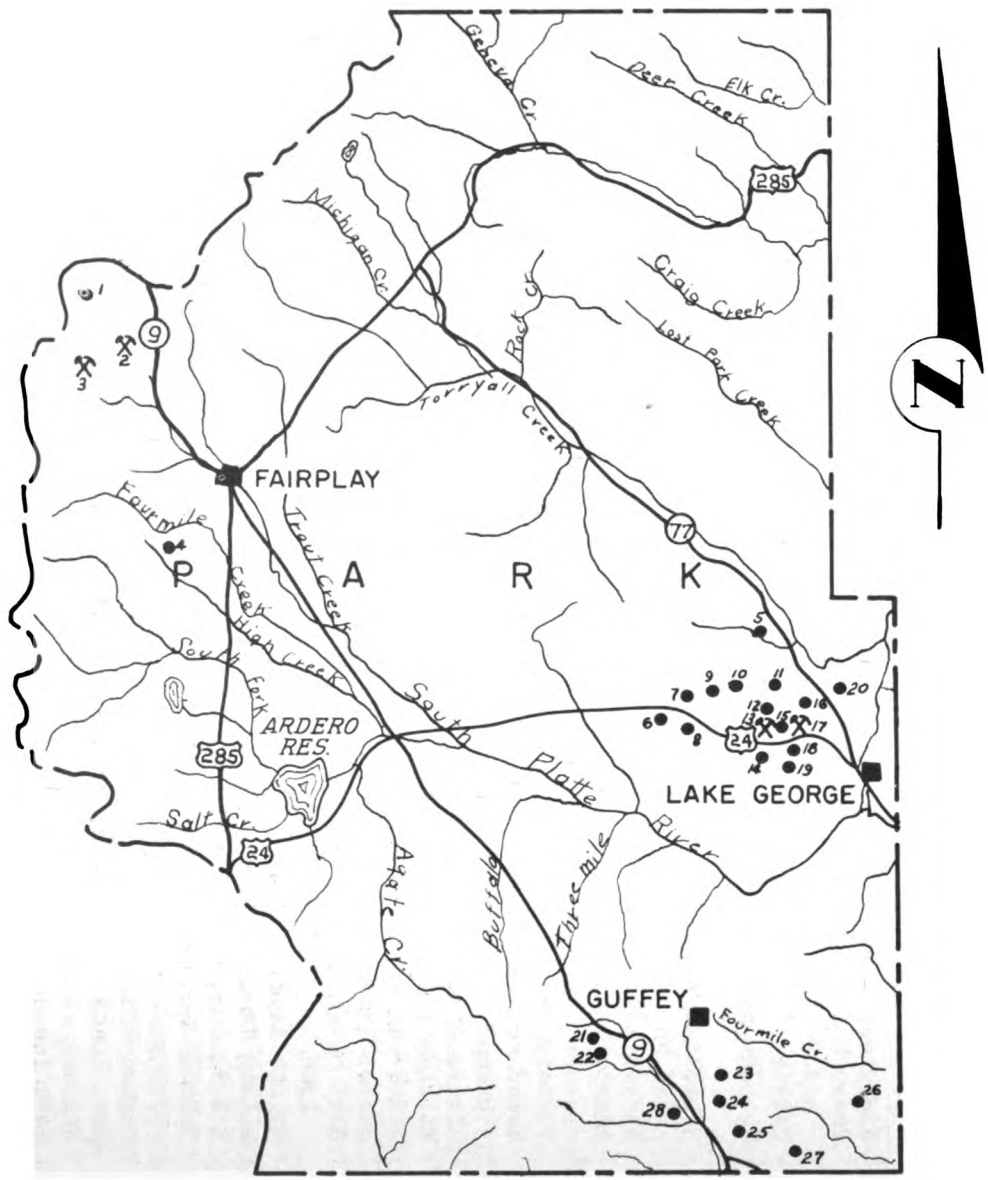

LEGEND

- TUNGSTEN MINE WITH PAST PRODUCTION
- TUNGSTEN PROSPECT
- 1 WHEELER MINE
- 2 ANDES MINE
- 3 SWEET HOME MINE
- 4 BOWERS RANCH
- 5 NIX GROUP
- 6 PEDRO NO.1 AND NO.2
- 7 HALLIE
- 8 ST. JOE GROUP
- 9 SCHEELITE NO.1 AND NO.2
- 10 BADGER GROUP
- 11 DOROTHY GROUP
- 12 VICTORY GROUP
- 13 ROUND MOUNTAIN GROUP
- 14 LITTLE ABNER
- 15 WILFLEY GROUP
- 16 JEFFERYES GROUP
- 17 JASPER QUEEN
- 18 ABEL MINERAL LAND
- 19 HOMES RANCH
- 20 GILLEY RANCH
- 21 B & G CLAIM
- 22 SCHOOL SECTION PROSPECT
- 23 COPPER KING MINE
- 24 WEST RANCH
- 25 SKINNEY CLAIM
- 26 NASH RANCH
- 27 JOHNSON RANCH
- 28 TOWNSEND RANCH

Figure 7. - Location of known tungsten prospects, Park County, Colo.

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These prospects are described in more detail below:

Wheeler Mine

The Wheeler mine at Wheeler Lake is in South Platte Gulch at an altitude of 12,500 feet. The property is reached by trail (4 miles) from the end of the road at Magnolia mine mill, one-half mile west of Montgomery. The country rock is pre-Cambrian granite cut by Tertiary intrusive dikes of white quartz-monzonite porphyry. Reportedly (10) the property has been mined for gold but contains some hübnerite. Little work has been done, and no production of tungsten ore has been recorded.

Andes Mine

The Andes mine is at the old townsite of Montgomery in South Platte Gulch at an altitude of 10,850 feet. The property is 1-1/2 miles by road from State Highway 9, from whence the town of Alma is 6 miles southward and Breckenridge 12 miles northward. The principal tungsten-bearing vein on the Andes claim is 4 inches to 4 feet wide, strikes N. 8° W., and dips 60° SW., following the structure of the enclosing pre-Cambrian quartz-monzonite gneiss. Vein material is mostly fine quartz, with abundant crystalline pyrite and minor amounts of wolframite and scheelite. The wolframite occurs as scattered crystals in 1 to 4 bands 2 to 8 inches wide. Workings consist of 2 adits, 25 and 50 feet long and 35 feet apart. A small amount of tungsten ore has been shipped.

Sweet Home Mine

The Sweet Home mine is in Buckskin Gulch, 5 miles above Alma by road, at an altitude of 11,335 feet. The property consists of 21 claims and has been opened by several adits, a 200-foot winze, and over 5,000 feet of laterals. It contains several veins and has been worked for copper-lead-silver ore, but one vein, exposed in the first drift to the northeast in the main adit, contains hubnerite. This vein strikes N. 60° E. through Pikes Peak granite (6) and is 12 inches wide, containing quartz, pyrite, gray copper, chalcopyrite, galena, and fluorspar, along with scattered hübnerite crystals. An ore shoot 10 feet long, assaying 2 percent WO_3, is exposed. The talus near the upper workings contains hübnerite float, from which 1,000 pounds of ore containing 10 percent WO_3 was shipped.

Bowers Ranch

The Bowers Ranch prospect is 7 miles south of Fairplay near the Weston Pass road at an altitude of about 9,400 feet. The prospect is reported by miners to contain scheelite in a garnetized zone. The small-scale geologic map indicates that the country rock is a sedimentary formation of Carboniferous age, with small intrusions of Tertiary igneous rocks. The prospect was not visited; very little development has been done, and no ore has been produced.

Nix Group

The Nix group comprises the Jack Rabbit, Spike Buck, and Bozo claims. The claims are on the west side of the Tarryall townsite, one-half mile by road from State Highway 77 and 15 miles northwest of Lake George at an elevation of about 8,450 feet. The country rock is pre-Cambrian gneiss and schist of the "Badger Mountain" belt, into which pegmatite masses have been intruded. Scheelite occurs associated with quartz, garnet, and epidote in steeply dipping lime-silicate beds that follow the schistosity. Development consists of 3 discovery holes and 225 feet of bulldozer trenching. No scheelite ore has been produced.

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Pedro No. 1 and No. 2

The Pedro claims are west of Wilkerson Pass on U. S. Highway 24 and 10 miles northwest of Lake George at an altitude of about 9,500 feet. The property is in the "Badger Mountain" belt of pre-Cambrian metamorphic rocks, which have been intruded by pegmatite masses. Scheelite occurs as crystals, flakes, and coatings associated with quartz, garnet, and epidote in steeply dipping, northeasterly trending lime-silicate beds that follow the schistosity of the country rock. The Pedro No. 2 claim, where exposed, has an ore zone 2 feet wide, which can be traced on surface for 240 feet. The zone shows very little garnet. The location hole on the Pedro claim 1 contains a 3-foot garnetized zone. Workings consist of two discovery holes. No tungsten ore has been shipped.

Hallie Claim

The Hallie claim is on the east side of Badger Mountain at an altitude of 10,000 feet and can be reached over a steep trail from U. S. Highway 24. Development consists of a location hole sunk on a garnetized zone in lime-silicate beds in pre-Cambrian metamorphic rocks. The locator reports that the garnetized zone carries scheelite with a fair assay value. No shipments have been made.

Saint Joe Group

The Saint Joe group of 3 claims is on the north side of U. S. Highway 24, 9 miles northwest of Lake George at an altitude of about 9,300 feet. The property is developed by a 1,200-foot crosscut adit, 3 shallow shafts, and several surface cuts. The country rock is pre-Cambrian schist that has been intruded by pegmatite dikes. Scheelite occurs as small crystals, grains, flakes, and thin coatings associated with garnet, chlorite, epidote, and quartz in steeply dipping lime-silicate beds that follow the schistosity. The adit cuts 4 definite lime-silicate beds or zones which strike N. 85° E. along the schistosity and dip about 75° N. Zone 1 is 528 feet from the portal and 223 feet below surface and follows along the south side of a 36-foot pegmatite dike. Zone 2 is 588 feet from the portal and about midway between a pegmatite dike 36 feet long and a dike 16 feet long farther north. Zone 3 is 608 feet from the portal and follows along the north wall of the pegmatite dike, which is 16 feet long. Zone 4 is 1,030 feet from the portal, 6 feet wide, and 350 feet below surface and consists of scattered scheelite in a siliceous and garnetiferous mica schist. A sample (4) taken from zone 1 indicates that the tungsten content is low. No tungsten ore has been shipped.

Scheelite Nos. 1 and 2

These claims are 2.5 miles by road from U. S. Highway 24 and 8 miles northwest of Lake George at an altitude of about 9,000 feet. The country rock is part of the Round Mountain belt of pre-Cambrian schist and gneiss, which has been intruded by pegmatite masses. Scheelite occurs as small crystals, flakes, and coatings associated with garnet, quartz, and epidote in steeply dipping lime silicate beds which strike northeastward along the foliation of the country rock. Workings consist of two discovery holes. No tungsten ore has been shipped.

Badger Group

The Badger group of 10 claims is 1-1/2 miles by road north of U. S. Highway 24 and 7 miles northwest of Lake George at an altitude of about 8,800 feet. The claims are mostly within the Round Mountain belt of pre-Cambrian metamorphic rocks that have been intruded by pegmatite masses. A zone 3 feet wide containing scheelite crystals and flakes, associated with quartz, garnet, epidote, and vesuvianite,

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occurs in steeply dipping lime-silicate beds that strike northeastward along the schistosity of the country rock. The property has been developed by 10 location holes and several bulldozer trenches. No shipments have been made from the property.

Dorothy Group

The Dorothy group of 4 unpatented claims is 3 miles north of U. S. Highway 24 by road and 8 miles northwest of Lake George at an altitude of about 8,800 feet. Scheelite-bearing lime-silicate beds are exposed in a zone 50 feet wide trending N. 30° E. and dipping 65° NW. in schists bordered by gneissic pre-Cambrian beds. There are at least 2 ore horizons up to 8 feet wide in which the ground mass consists principally of garnet, epidote, and quartz with irregularly scattered scheelite. Workings consist of four shallow pits. Two samples are reported (1) to have averaged 0.80 percent WO_3 for a width of 4.2 feet. No shipments of tungsten ore have been reported.

Victory Group

The Victory group consists of four claims located end-to-end adjoining the Round Mountain group at the north. The property is 2 miles by road from U. S. Highway 24 and 7 miles northwest of Lake George at an altitude of about 8,600 feet. The country rock is pre-Cambrian schists and gneisses in which lime-silicate beds, following the schistosity, contain garnetized lenses with scattered scheelite. The property has been developed by several shallow pits and a 40-foot shaft sunk years ago. It is reported (1) that the shaft shows 1 foot of scheelite ore near the bottom where the ore widens to 8 feet and reportedly contains 1.82 percent WO_3. No shipments have been made from this property.

Round Mountain Group

The Round Mountain group of four unpatented claims were located by D. W. Denny in 1943. The property is 1 mile by road from U. S. Highway 24 and 6 miles northwest of Lake George at an altitude of about 8,400 feet. Scheelite occurs as crystals, grains, flakes, and thin coatings along with garnet, vesuvianite, and epidote in lime-silicate beds striking N. 17° E. to N. 56° E. These beds dip 70° NW. and follow the schistosity of the pre-Cambrian schist country rocks that have been irregularly cut by pegmatite masses. Workings consist of 8 trenches, 7 pits, and 5 shafts 10 to 27 feet deep. A 2-foot scheelite streak in the 20-foot shaft is reported to have assayed 0.60 percent WO_3. A shipment of 14 tons of ore containing 0.63 percent WO_3 was made to the Salida stockpile during World War II.

Little Abner Group

The three unpatented claims of the Little Abner group have been located end-to-end and adjoin the Round Mountain group on the south. The property is on U. S. Highway 24, 5 miles northwest of Lake George at an altitude of about 8,400 feet. Scattered scheelite crystals, flakes, and coatings occur in lenses in lime-silicate beds together with quartz, garnet, vesuvianite, and epidote. The lime-silicate beds follow the foliation of the pre-Cambrian schist country rock in a northeasterly direction and dip steeply northwest. The property is developed by several shallow pits and trenches. A 12-foot pit reportedly (1) contains a scheelite zone 9 feet wide, which can be traced for 190 feet on surface. No tungsten ore has been shipped from the property.

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Wilfley Group

The Wilfley group of 7 claims is east of Round Mountain and north of U. S. Highway 24 at an altitude of about 8,200 feet. The claims are 5-1/2 miles northwest of Lake George and were developed originally for gold. Scheelite reportedly occurs as small crystals, flakes, and coatings associated with quartz, garnet, and epidote in nearly vertical, lime-silicate beds which strike northeastward along the schistosity of pre-Cambrian metamorphic rocks. Workings consist of a 100-foot shaft, a 140-foot shaft, a number of pits, and 3 recent surface cuts. No scheelite ore has been produced from the property.

Jefferyes Group

The Jefferyes group of 5 patented and 2 unpatented claims is 1 mile west of State Highway 77 and 6 miles northwest of Lake George at an altitude of about 8,300 feet. Exposures are very similar to the other deposits in the Tarryall Springs district; scheelite, occurring in garnetiferous rocks of a highly metamorphosed pre-Cambrian series, is distributed irregularly in varying concentration along the northeast strike of the schistosity. Workings consist of cuts, pits, short adits, and shallow shafts. No tungsten ore has been shipped from the property.

Jasper Queen

The Jasper Queen is 4.6 miles west of Lake George on U. S. Highway 24 at an elevation of about 8,350 feet. Scheelite occurs as small crystals, grains, flakes, and thin coatings in lenses in lime-silicate beds and is associated with garnet, quartz, epidote, and vesuvianite, with minor amounts of copper sulfides, copper carbonates, and molybdenite. The lime-silicate beds are 25 to 100 feet wide and follow the schistosity of the pre-Cambrian mica schist and hornblende gneiss country rocks which bear N. 15° E. Ore bodies are rarely over 40 to 50 feet long. At the Jasper Queen the largest ore shoots are 15 to 20 feet long, 10 to 12 feet wide, and 5 to 10 feet deep. Development consists of 10 shallow pits, 2 trenches, and a short shaft. The Hayden Mining Co. shipped 3,700 pounds of tungsten ore containing 1.30 percent WO_3 and 14 tons of ore containing 0.62 percent WO_3 to the Boulder stockpile during World War II.

Abel Mineral Land

The Abel Mineral Land is a 160-acre tract in which mineral rights were reserved when the surfaces rights were purchased for the Holmes Ranch. The property is in the Fire Fly belt south of U. S. Highway 24 and 4 miles northwest of Lake George by road at an altitude of about 8,700 feet. The country rock is pre-Cambrian schist, gneiss, and granite in which scheelite occurs in small crystals, flakes, and coatings associated with quartz, garnet, epidote, and vesuvianite in steeply dipping lime-silicate beds which strike northeastward along the planes of schistosity of the country rock. The workings show a 3-foot garnetized zone containing scheelite which can be followed for 1,300 feet to the southwest toward the workings on the Holmes Ranch. Workings include 6 small pits and a 36-foot shaft. No shipments have been made from the property.

Holmes Ranch

The mineral occurrence on the Holmes Ranch is the continuation of the Abel zone to the southwest. The scheelite zone is 3 feet wide. Development work consists of a few shallow pits and trenches. No production has been made.

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Gilley Ranch

The shaft on the Gilley Ranch is in the extreme northeast end of the Fire Fly belt 2 miles by road east of State Highway 77 and 7-1/2 miles north of Lake George at an approximate altitude of 8,200 feet. Scheelite occurs in small crystals, flakes, and coatings, associated with quartz, garnet, epidote, and vesuvianite and in nearly vertical, northeasterly striking lime-silicate beds. Development consists of a 50-foot shaft sunk originally for gold and a 75-foot drift at the bottom of the shaft. A garnetized zone at the bottom of the shaft is 5 feet wide. The drift wanders away from the zonebut cuts it near the face. According to the owner, the 5-foot zone contains scheelite ore averaging 1 percent WO_3. The mine has just been rehabilitated, but no shipments of scheelite ore were reported during 1954.

B and G Claim

The B and G claim was located in 1952. The property is about 1 mile by road south of State Highway 9 and 10 miles northwest of Guffey. The country rock is pre-Cambrian schist, gneiss, and granite cut by pegmatite intrusions. The northwesterly striking mineralized zones are highly altered garnetized lenses in lime-silicate beds which follow the schistosity of the country rock. The ore mineral is scheelite, which occurs as small flakes and thin coatings. The claim has been developed by 2 shafts 10 and 15 feet deep. The scheelite zone is low-grade, and no ore has been shipped.

School Section Prospect

The School Section prospect is 1-1/2 miles south of State Highway 9 by road and 10-1/2 miles northwest of Guffey. The property consists of 80 acres that have been leased from Colorado. The country rock is pre-Cambrian metamorphic, cut by pegmatite masses. The mineralized zone is between two northerly striking pegmatite dikes and apparently strikes northwestward between these pegmatite intrusions. The scheelite occurs as crystals, grains, flakes, and coatings and is associated with garnet, quartz, epidote, and vesuvianite in steeply dipping lime-silicate beds. The property is developed by two 15-foot shafts and by 5 surface cuts, the largest being 25 feet long and 12 feet deep. A sample in the deepest cut assayed 0.84 percent WO_3 for 16 feet. No tungsten ore has been shipped from the property.

Copper King Mine

The Copper King is an old gold mine near Guffey, which reportedly contains scheelite. The country rock is pre-Cambrian schist, gneiss, and granite. The property, which was not inspected, is held under option by Mining Ventures, Inc.

West Ranch

The West Ranch consists of 160 acres of deeded land, 1 mile south of Guffey by road. The country rock is pre-Cambrian metamorphic cut by pegmatite masses. Scheelite as small crystals, flakes, and coatings associated with garnet and quartz occurs in steeply dipping lime-silicate beds that follow the schistosity. Development consists of a few shallow trenches. No scheelite ore has been shipped.

Skinney Claim

The Skinney claim is near State Highway 9 and 1.5 miles south of Guffey by road. The country rock is pre-Cambrian metamorphic rocks. Scheelite occurs in northwesterly trending, steeply dipping, lime-silicate beds that follow the foliation. Small crystals, flakes, and coatings of scheelite are associated with quartz

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and garnet. Development consists of a discovery cut showing a small amount of scheelite. No tungsten ore has been produced.

Nash, Johnson, and Townsend Ranches

Mining Ventures, Inc., hold options on the mineral rights, presumably for tungsten, on 180 acres of each of these ranches, which are near Guffey. Country rock is pre-Cambrian granites, schists, and gneisses intruded by irregular masses of pegmatite. Scheelite occurs as small crystals, flakes, and thin coatings associated with quartz and garnet in steeply dipping, lime-silicate beds. Development work consists of only a few shallow pits and trenches. Sampling results are not available, and shipments of scheelite ore have not been made.

Summit County

The known tungsten deposits are in a small area in the extreme southern end of Summit County near the head of Monte Cristo Creek. The country rock is pre-Cambrian schist, gneiss, and granite cut by numerous pegmatites and dikes of Laramide monzonite porphyry. The veins strike northeastward. The principal ore mineral is hübnerite, although scheelite occurs in all the ores closely associated with the hubnerite as coatings, rings, and veinlets.

Three tungsten prospects have been partly developed (fig. 8). The names, locations, and owners follow:

Map No.	Mine	Location	Owners
1	H. and M. Williams claims	Sec. 33, T. 7 S., R. 75 W.	Abandoned.
2	Navy	Sec. 3, T. 8 S., R. 78 W.	R. Parker and M. Sheldon.
3	Thomas Williams claims	Sec. 4, T. 8 S., R. 78 W.	Thomas Williams.

The deposits are described in more detail below:

H. and M. Williams

The H. and M. Williams claims were located in the early 1940's by Harold and Milo Williams. The property is high up on the south side of Quandary Peak at an elevation of about 12,000 feet. The claims are reached by a steep trail from Lower Blue Lake, from whence State Highway 9 is 2.5 miles over a fair access road and Breckenridge is 10.5 miles to the north. Small, northeasterly striking veins have been developed by shallow surface workings. Several small shipments have been made from float and from surface outcrops.

Navy Mine

The Navy mine consists of 2 patented claims at Lower Blue Lake, 2.5 miles west of State Highway 9 and 10.5 miles from Breckenridge at an altitude of 11,400 feet. The Navy vein strikes N. 21° E., dips 70° SE., and is 3 inches to 3 feet wide in metamorphic rocks but pinches when in pegmatites and porphyries. The vein consists of quartz with minor amounts of fluorite, pyrite, hübnerite, scheelite, chalcopyrite, sphalerite, galena, and molybdenite (10). Tungsten occurrences are small and scattered. Hübnerite occurs as scattered crystals in the quartz. Operations were started first on the north or Quandary Mountain side of Monte Cristo Creek, where development consists of 4 adits 100, 70, 75, and 125 feet long and a surface cut that has exposed the vein 3 to 30 inches in width, with an average of 2 percent WO_3, for 300 feet. This cut was made 5 to 10 feet above the

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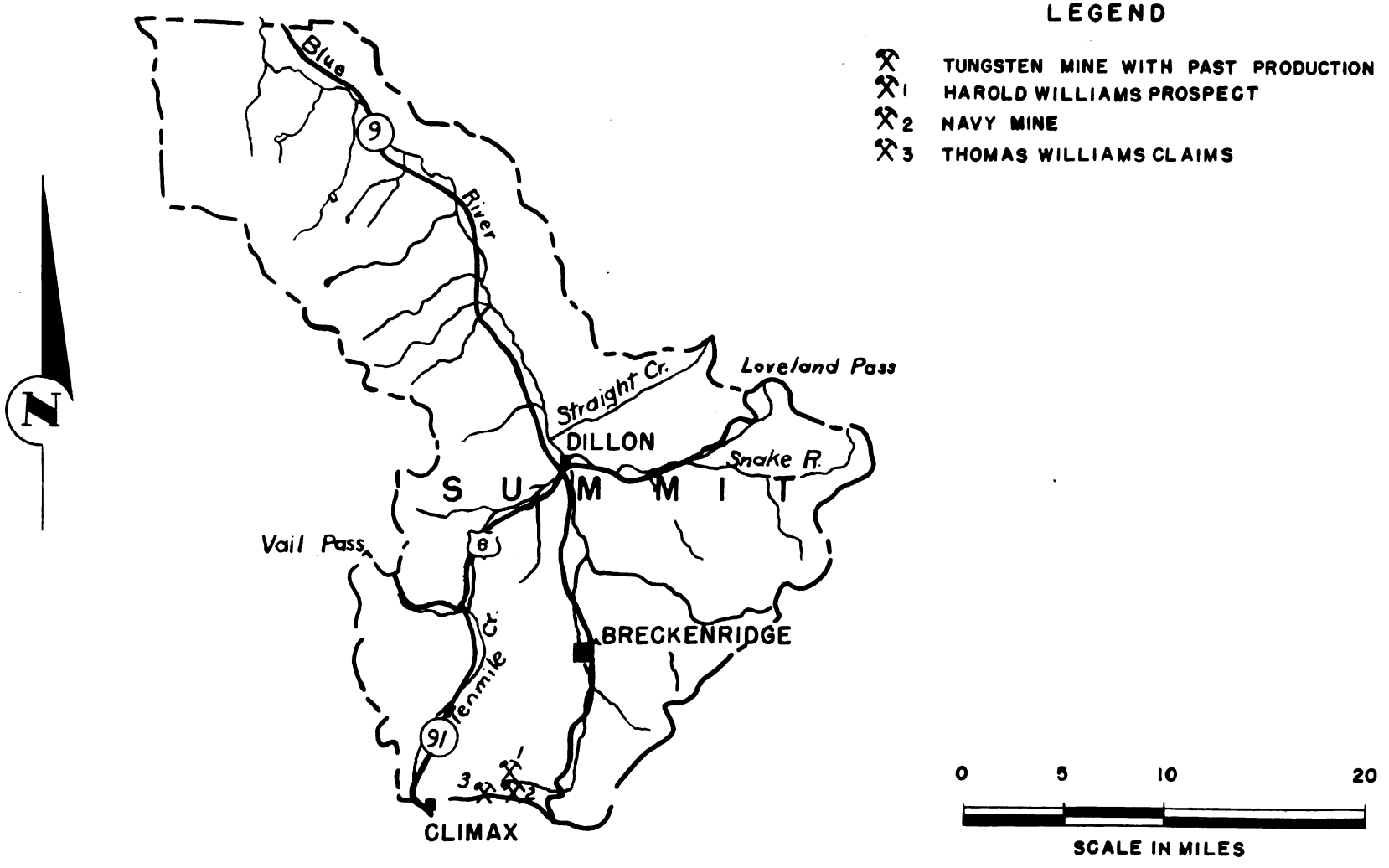

Figure 8. - Location of known tungsten prospects, Summit County, Colo.

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underlying pegmatite. Toward the south side, on North Star Mountain, the vein is developed by a 160-foot tunnel and surface cuts up to an altitude of 12,000 feet, where some 9-percent WO_3 ore was selectively produced.

Thomas Williams Claims

The Thomas Williams group of 3 unpatented claims is at an altitude of 11,800 feet near Upper Blue Lake in Monte Cristo Gulch, 3.5 miles by road from State Highway 9 and 11.5 miles from Breckenridge.

The vein is similar to the Navy vein, striking N. 35° E. and dipping 65° NW. Development consists of a 60-foot adit and small, scattered pits on the south side of Monte Cristo Gulch. Two lenses 10 to 15 feet long show quartz, pyrite, hübnerite, scheelite, chalcopyrite, sphalerite, and galena. A little 5-percent ore has been produced from the claims.

ORE RESERVES

Ore reserves have been assembled from reports on the various properties.

Inferred ore in place (20 properties) is estimated as 44,719 tons containing 0.80 percent WO_3 or 35,992 units. Total inferred ore (20 properties) is estimated as 45,919 tons averaging 0.81 percent WO_3 and containing 37,192 units. This is in addition to the indicated ore in place at Climax and the tailings which contain recoverable tungsten provided they are re-treated for other products such as topaz, monazite, and tin.

METALLURGY

The scheelite ores of Chaffee, Fremont, Gunnison, Larimer, and Park Counties occur as thin layers in quartz-biotite schist (Larimer County) or as crystals, grains, flakes, and thin coatings. Larimer County scheelite ore has been sorted with the aid of a florescent light and the product concentrated in the Teal gravity mill west of Boulder with no apparent difficulty. Other shipments of scheelite ore have been small and have gone mostly to Government stockpiles or for testing purposes. One test by a Denver firm indicated that scheelite ore from the Stockton mine in Chaffee County could be concentrated to 67.3 percent WO_3 with a 95.7-percent recovery by gravity methods. Favorable tests were also made on ore from the School Section (Park County). Only one mill has been erected within the five counties for treating scheelite ore, and this was never completed.

Wolframite and hubnerite ores occur in Fremont, Gunnison, Lake, Park, and Summit Counties. Hübnerite and wolframite ores have been jigged or hand-sorted and shipped. A small mill (fig. 9) was built to treat the ores from the Gold Hill area in Gunnison County in 1951. Although the ore is amenable to gravity concentration results were not satisfactory, and the mill was being revamped at the time of inspection. The Climax Molybdenum Co. erected an addition to its mill in 1948. The Climax ore is crushed and ground, and the molybdenite is removed by flotation. The tailing from the molybdenite mill goes to the tungsten plant (fig. 10), where it is passed through Humphreys spirals. The concentrate from the spirals is treated in flotation cells to remove the pyrite. The tailing from the pyrite cells passes over Diester tables, and the wet concentrate is passed over a Crocket magnetic separator to remove iron. The product is then dewatered, dried, and passed over a Witherill magnetic separator. The B tungsten concentrate goes to a flotation machine, where an A-grade and a D-grade tungsten concentrate are made. The tailing from the Witherill magnetic separator is screened; the undersize is treated with a 4-pole Dings EKB magnetic separator, and a second D-grade concentrate is recovered.

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BON TON MILL

(Powered by gasoline engines)

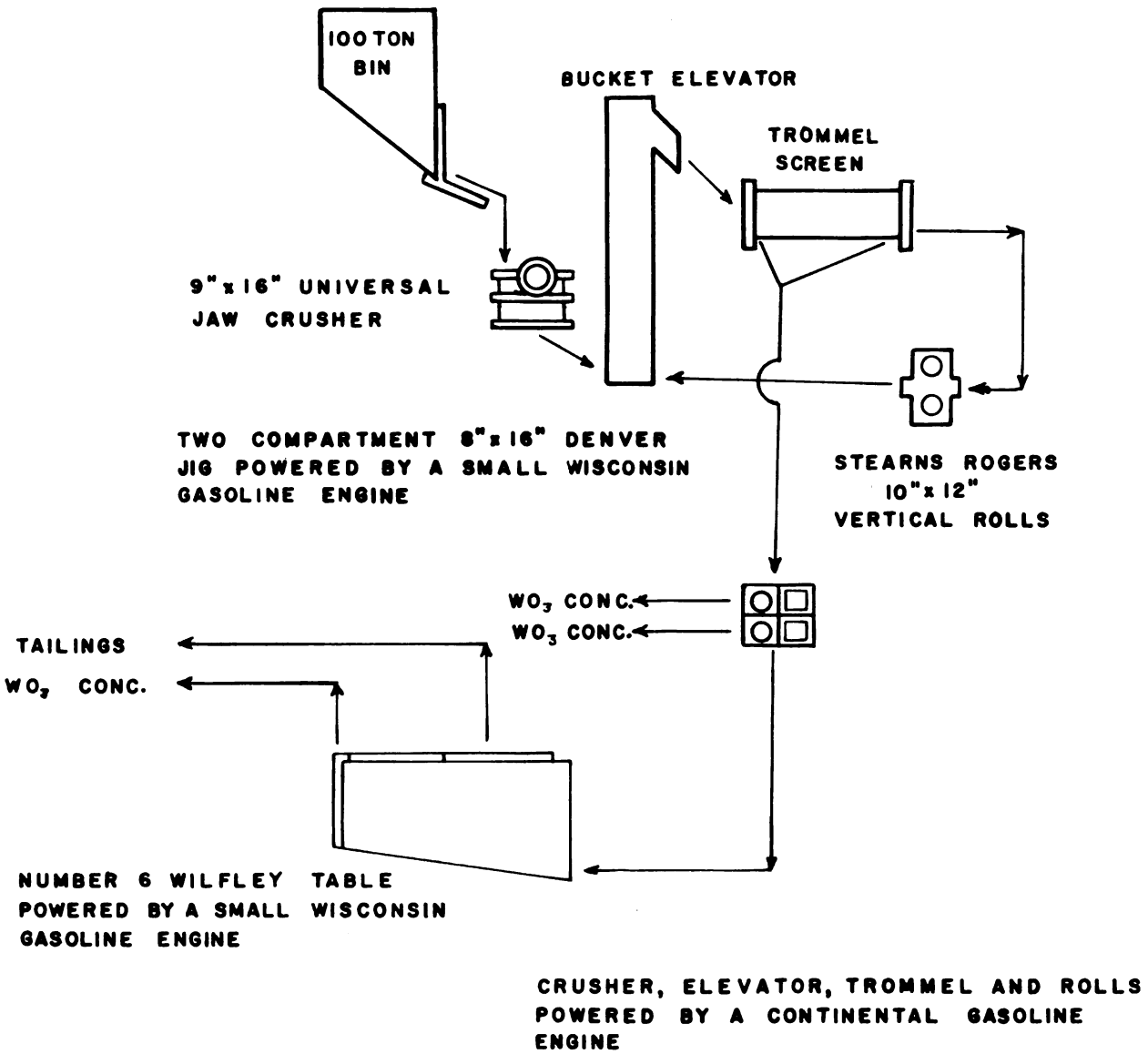
100 TON BIN
BUCKET ELEVATOR
TROMMEL SCREEN
9" x 16" UNIVERSAL JAW CRUSHER
TWO COMPARTMENT 8" x 16" DENVER JIG POWERED BY A SMALL WISCONSIN GASOLINE ENGINE
STEARNS ROGERS 10" x 12" VERTICAL ROLLS
WO_3 CONC.
WO_3 CONC.
TAILINGS
WO_3 CONC.
NUMBER 6 WILFLEY TABLE POWERED BY A SMALL WISCONSIN GASOLINE ENGINE
CRUSHER, ELEVATOR, TROMMEL AND ROLLS POWERED BY A CONTINENTAL GASOLINE ENGINE

Figure 9. - Flowsheet of Bon Ton tungsten mill, Gunnison County, Colo.

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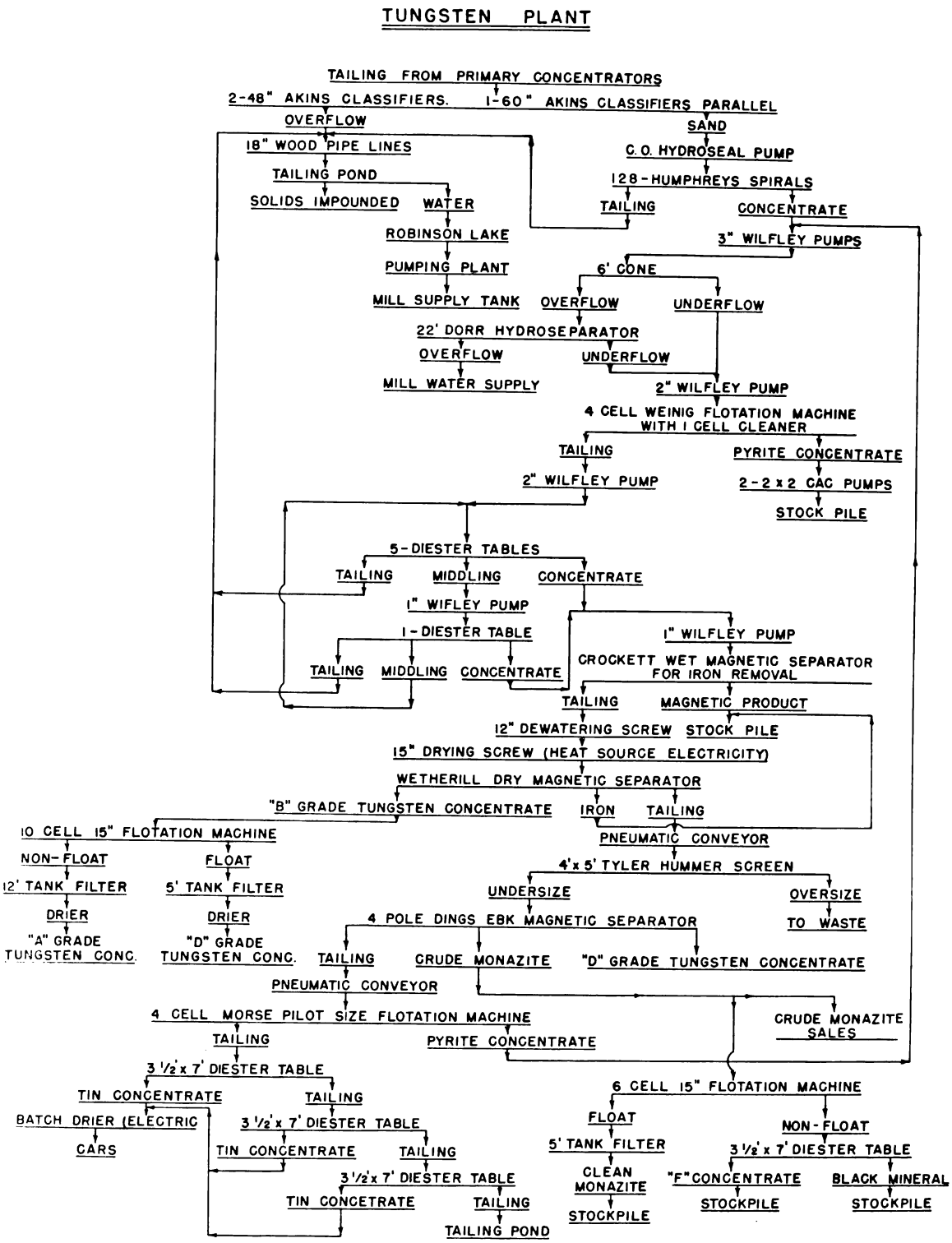

Figure 10. - Flowsheet of tungsten, tin, and monazite concentrating units in the Climax Molybdenum Co. mill.

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